Market integration, agricultural diversification and erosion risk in northern Thailand

The problem

- In Southeast Asia, montane cropping systems are rapidly diversifying as soon as they are integrated into the market economy,
- In this fragile ecosystem, erosion by concentrated runoff is a major problem that limits the productivity and sustainability of annual cropping systems,
- The effect of the current agricultural diversification process on erosion risk is poorly documented.

Research objectives

- To analyze recent land use changes at the research site between 1990 and 1994,
- To assess the impact of these changes on erosion risk at field and small watershed scales.

A multiscale methodology linking

- A two-year field-level agronomic survey comparing the effects of the main cropping systems on the risk of erosion via concentrated run-off across a range of slope characteristics and rainfall occurrences, and
- A GIS analysis of the spatial distribution and quantification of land use changes in watersheds,
- To integrate key thresholds (for slope angle and length) and indicators (of the degree of susceptibility to erosion of the main cropping systems) identified by the agronomic survey into the GIS to map the evolution of erosion risk following four years of cropping systems diversification.

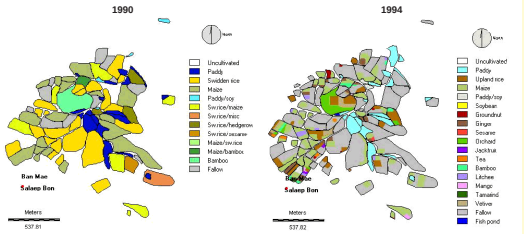
Monitoring changes in erosion symptoms between two rain showers in farmers'fields, Paka Sukjai watershed

The study site

In the extreme northern region of Thailand, the «Golden Triangle», the Mae Salaep and Paka Sukjai watersheds farmed by Akhas highlanders are characterized by:

- An advanced stage of diversification of agricultural production systems following 15 years of integration into the regional, national, and international market economy,
- Most of the cultivated fields located on steep slopes with angles of 10-40%, and sometimes up to 60%,
- A future expansion of farmed land being very limited by government environmental protection measures,
- Already extremely short fallow periods (generally 1 or 2 years), while every year more fields become permanently cultivated.

Spatial distribution of crops in Mae Salaep watershed in 1990 and 1994 wet seasons

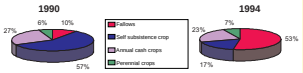


Panoramic view of Paka Sukjai watershed in Chiang Rai province, upper northern Thailand.

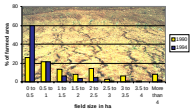
Several key changes tend to limit erosion risk

- An important decrease in the size of fields, and hence their slope lengths,
- An increase in the share of fallow land, especially on the very steep slopes,
- An important decrease in the production of upland rice, a subsistence and high erosion risk crop,
- A limited expansion of the irrigated paddy ecosystem on bench terraces,
- An important production of annual cash crops in smaller fields, closer to the village,
- The recent appearance of horticultural and perennial cash cropping systems.

Land use dynamics in Mae Salaep watershed between 1990 and 1994.

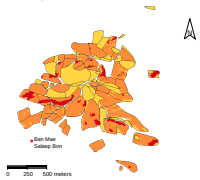


Distribution of field size in Mae Salaep watershed in 1990 and 1994 wet seasons.



In most cropping situations, erosion risk decreased between 1990 and 1994

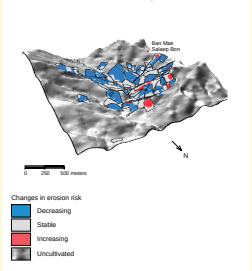
Spatial distribution of erosion risk in Mae Salaep watershed in 1990 wet season



Matrix of erosion risk according to key thresholds and landuse classes in Mae Salaep watershed, 1990 wet season

SLOPE CHARACTERISTICS		LANDUSE CLASSES			
Angle (%)	Length (m)	Fallow perennial paddy paddy/soy	Cash crop with low value added	Cash crop with high value added	Upland rice
< 47	< 25				
	> 25				
> 47	< 25				
	> 25				
EROSION RISK		Low	Medium	High	

Changes in erosion risk between 1990 and 1994 in Mae Salaep watershed.



Conclusions

- For the Mae Salaep watershed, the agricultural diversification process observed during the early nineties tends to decrease the risk of land degradation caused by erosion via concentrated runoff,
- Problem cropping situations in the watershed are identified and located spatially. Targeted soil and water conservation interventions on the overall farm can be implemented to find adapted ways to decrease erosion risk in these particular fields.

References

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Guy Trébuil [1-2], Thierry Boch [2], Charal Thong-Ngam [4], Francis Turkelboom [3], Agnès Bégué [2]

IRRI

(1) International Rice Research Institute P.O. Box 3127, MCPO 1271 Makati City, Philippines.

(2) CIRAD Centre de coopération internationale en recherche agronomique pour le développement BP 5035, 34032 Montpellier, cedex 1, France.

(3) KULeuven K. Mercierlaan 92, 3001 Leuven, Belgium

(4) Departement of Public Welfare/HESDP Chiang Mai Government Center 53000 Chiang Mai, Thailand.

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